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PENSOFT

Tegenaria hasperi Chyzer, 1897 and *Zoropsis spinimana* (Dufour, 1820), newly recorded synanthropic spiders from Slovakia (Araneae, Agelenidae, Zoropsidae)

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Abstract

Tegenaria hasperi Chyzer, 1897 (Agelenidae) and *Zoropsis spinimana* (Dufour, 1820) (Zoropsidae) are recorded in Slovakia for the first time. Both species were collected in synanthropic habitats in Western Slovakia. Two males of *T. hasperi* were collected in the garden of a family house, and both sexes of *Z. spinimana* were recorded from the interiors and exteriors of buildings in four separate cities, representing the first record of the family Zoropsidae in Slovakia. This contribution provides additional information on the morphological characteristics of these species. Digital images of their habitus and copulatory organs, as well as their distribution and habitat preferences are included.

Keywords

Central Europe, distribution, faunistics, first records, introduced, non-native species

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Introduction

Research into synanthropic spider species in the territory of Slovakia has a relatively long history, starting in earnest in the mid 1980s with published reports of several synanthropic species new for the Slovak fauna, including: *Oonops domesticus* Dalmas, 1916 (Žitňanská 1975), *Cheiracanthium mildei* L. Koch, 1864 (Bílek 1975), *Spermophora senoculata* (Dugès, 1836), and *Triaeris stenaspis* (Simon, 1892) (Miller and Žitňanská 1976). The results of this research were summarized by Szinetár et al. (2020). In the last decade, in addition to alien eusynanthropic species new for the Slovak fauna (e.g., *Parasteatoda tabulata* (Levi, 1980) (Šestáková and Gajdoš 2011), *Coleosoma floridanum* Banks 1900 (Šestáková et al. 2013), *Scytodes fusca* Walckenaer, 1837 (Šestáková et al. 2014), and *Hasarius adansoni* (Audouin, 1826) (Šestáková et al. 2017)), species native to the continent have been found in Slovakia. These are species that have spread from other parts of Europe into Slovakia (e.g.,

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Uloborus plumipes Lucas, 1846 in a botanical garden in Košice; Suvák 2013). Our paper includes two more species of native European spiders, classified by Szinetár et al. (2020) as synanthropic in the conditions of Central Europe (Hungary, Slovakia, and Romania): the moderately typical hemisynanthropic *Tegenaria hasperi* Chyzer, 1897 (Agelenidae) and the eusynanthropic *Zoropsis spinimana* (Dufour, 1820) (Zoropsidae).

Methods

All of the studied material were collected/photographed in Western Slovakia (Figs 1, 3). Specimens of *Tegenaria hasperi* were collected in the village of Machulince using pitfall traps installed in wood storage and an orchard near a family house from October 2017 to October 2018. Three individuals of *Zoropsis spinimana* were collected by direct sampling in buildings in the cities of Nitra and Sered'; three other individuals were observed and photographed in the cities of Bratislava and Pezinok.

Microscopic images of the habitus and copulatory organs and measurements were obtained using an Olympus SC 100 attached to an Olympus SZx16 stereomicroscope and edited with Olympus Stream basic. Images were taken in different focal planes, and stack images were combined using Zerene Stacker. All measurements are in millimeters. The preserved specimens are deposited in the Institute of Landscape Ecology of the Slovak Academy of Sciences, Nitra (ILE SAS, curator: P. Purgat).

Results

Agelenidae C.L. Koch, 1837

***Tegenaria hasperi* Chyzer, 1897**
Figure 2

Identification references. Deltshev 1993: 172, figs 14, 15 (♂); Seyyar et al. 2009: 122–124, figs 2, 3 (♂). For the complete list of references, see World Spider Catalog (2021).

Material examined. SLOVAKIA – **Western Slovakia** • Machulince (Fig. 1); 48°24′55″N, 018°25′43″E, 228 m a.s.l.; 1.VI–VII.2018; N. Ondrejková, Z. Krumpálová leg.; wood storage; pitfall trap; 1 ♂, ILE SAS-1388 (Fig. 2A) • Machulince; 48°24′52″N, 018°25′40″E, 227 m a.s.l.; 1.VI–1.VII.2018; N. Ondrejková, Z. Krumpálová leg.; orchard; pitfall trap; 1 ♂, ILE SAS-1389.

Identification. Male pedipalp: tibial apophysis formed by two strongly chitinized protrusions separated by a

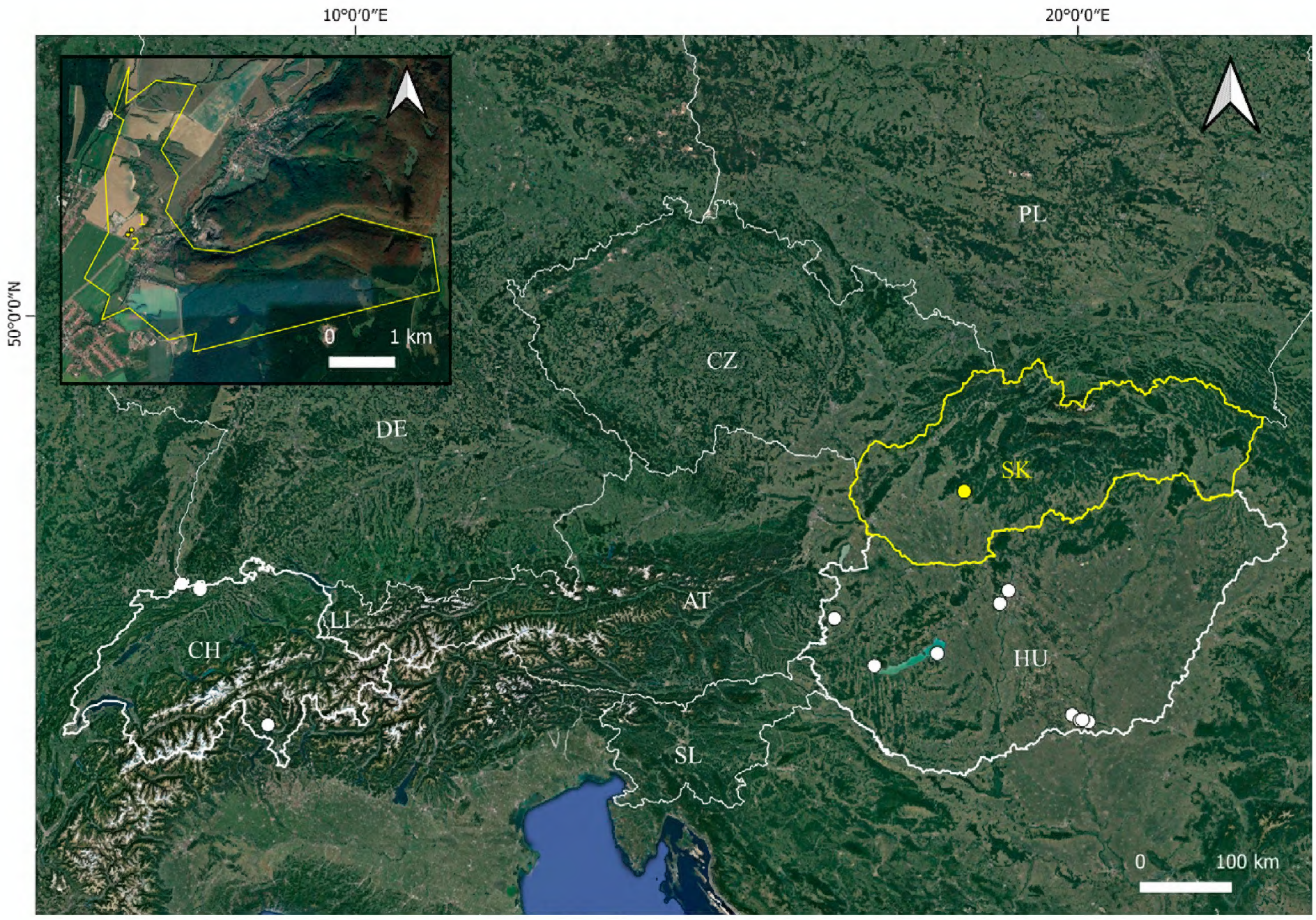

Figure 1. Distribution of *Tegenaria hasperi* in Central Europe (Ištok 1999); white border = borders of Central European countries, yellow border = Slovak border, white circle = published records updated according to the literature (Hänggi et al. 2014; Hänggi and Straub 2016; Szinetár and Vajda 1992; Kovács and Szinetár 2012), yellow circle = new records, 1 = locality Machulince, wood storage, 2 = locality Machulince, orchard; AT – Austria, CZ – Czech Republic, DE – Germany, HU – Hungary, CH – Switzerland, LI – Liechtenstein, SK – Slovakia, SL – Slovenia, PL – Poland.

Figure 2. *Tegenaria hasperi* Chyzer, 1897 from Slovakia. **A.** Adult male. **B.** Left pedipalp, dorsoretrolateral view. **C.** Idem., prolateral view. **D.** Idem., ventral view. Scale bars: A = 1 mm, B–D = 0.2 mm

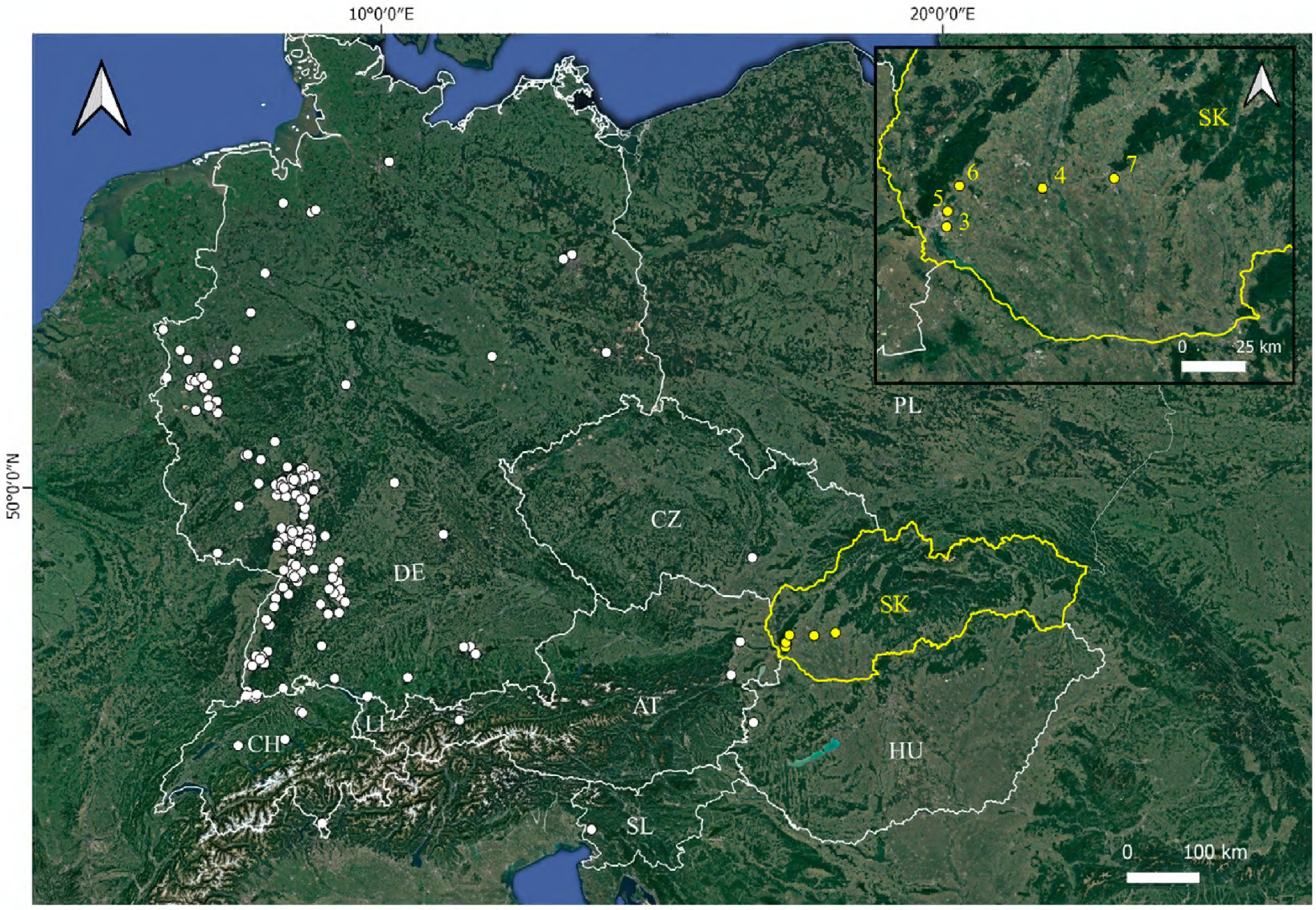

Figure 3. Distribution of *Zoropsis spinimana* in Central Europe (Ištok 1999); white border = borders of Central European countries, yellow border = Slovak border, white circle = published records updated according to the literature (Thaler and Knoflach 1998; Kuntner and Kostanjšek 2000; Kostanjšek and Kuntner 2002; Hänggi 2003; Hänggi and Bolzern 2006; Szinetár et al. 2014; Dolejš and Prudek 2019; Atlas of the European Arachnids 2021), yellow circle = new records, 3 = locality Bratislava, Vrakuňa, 4 = locality Sereď, 5 = locality Bratislava, Vajnory, 6 = locality Pezinok, 7 = locality Nitra; AT – Austria, CZ – Czech Republic , DE – Germany, HU – Hungary, CH – Switzerland, LI – Liechtenstein, SK – Slovakia, SL – Slovenia PL – Poland.

narrow gap; spoon-shaped protrusion above tibial apophysis, adjacent to the lower part of the bulb (Fig. 2B); embolus consists of two protrusions, the lower being longer and more pointed (Fig. 2B–D) (Kovács and Szinetár 2012). **Female epigyne:** distinct rectangular median plate (Nentwig et al. 2020).

Measurements of the two Slovak males (Fig. 2). Body length: 4.34 and 4.99; prosoma length: 2.25 and 2.38, width 1.98 and 2.21; opisthosoma length: 2.09 and 2.61, width 1.26 and 1.75.

Zoropsidae Bertkau, 1882

***Zoropsis spinimana* (Dufour, 1820)**
Figures 4–7

Identification references. Thaler and Knoflach 1998: 175–176, figs 2–6 (♂, ♀); Griswold and Ubick 2001: 112, figs 2–5 (♂, ♀). For the complete list of references, see World Spider Catalog (2021).

Material examined. SLOVAKIA – **Western Slovakia** • Sereď (Fig. 3); 48°16′39″N, 017°42′37″E, 123 m a.s.l.; 26.X.2019; N. Ondrejková leg.; building interior; individual capture; 1 ♀, ILE SAS-1390 • Nitra; 48°18′43″N, 018°05′18″E, 144 m a.s.l.; 12.II.2020; N. Kráľová leg.; building interior; individual capture; 1 ♂, ILE SAS-1391 (Fig. 4C) • Same locality; 19.IV.2020; N. Kráľová leg.; building interior; individual capture; 1 ♀, ILE SAS-1392.

Observations. SLOVAKIA – **Western Slovakia** • Bratislava, Vrakuňa (Fig. 3); 48°08′30″N, 017°12′11″E, 132 m a.s.l.; 8.IX.2016; M. Everlingová; garden; photo documentation; 1 ♀ (Fig. 4A) • Same locality; 9.V.2018; M. Everlingová; garden; photo documentation; 1 ♀ (Fig. 4B) • Bratislava, Vajnory; 48°11′47″N, 017°12′30″E, 129 m a.s.l.; 17.X.2019; S. Kuruc; building exterior; photo documentation; 1 ♀ (Fig. 5A) • Pezinok; 48°17′13″N, 017°16′18″E, 157 m a.s.l.; 25.XI.2019; M. Trojanová; building interior; photo documentation; 1 ♂ (Fig. 5B).

Identification. Male pedipalp: embolus short, blunt with attendant membranous protrusion (Thaler and Knoflach 1998); median apophysis hook-shaped; cymbium with dorsal field of short, dense bristles; conductor transparent (Nentwig et al. 2020); tegulum proximally narrowed with sclerotized lateral sides (Thaler and Knoflach 1998) (Fig. 6). **Female epigyne:** scapus long, narrow, finger-shaped (Nentwig et al. 2020) (Fig. 7).

Measurements of Slovak specimens (Figs 4C, 6, 7). Male: body length: 15.51; prosoma length: 7.44, width

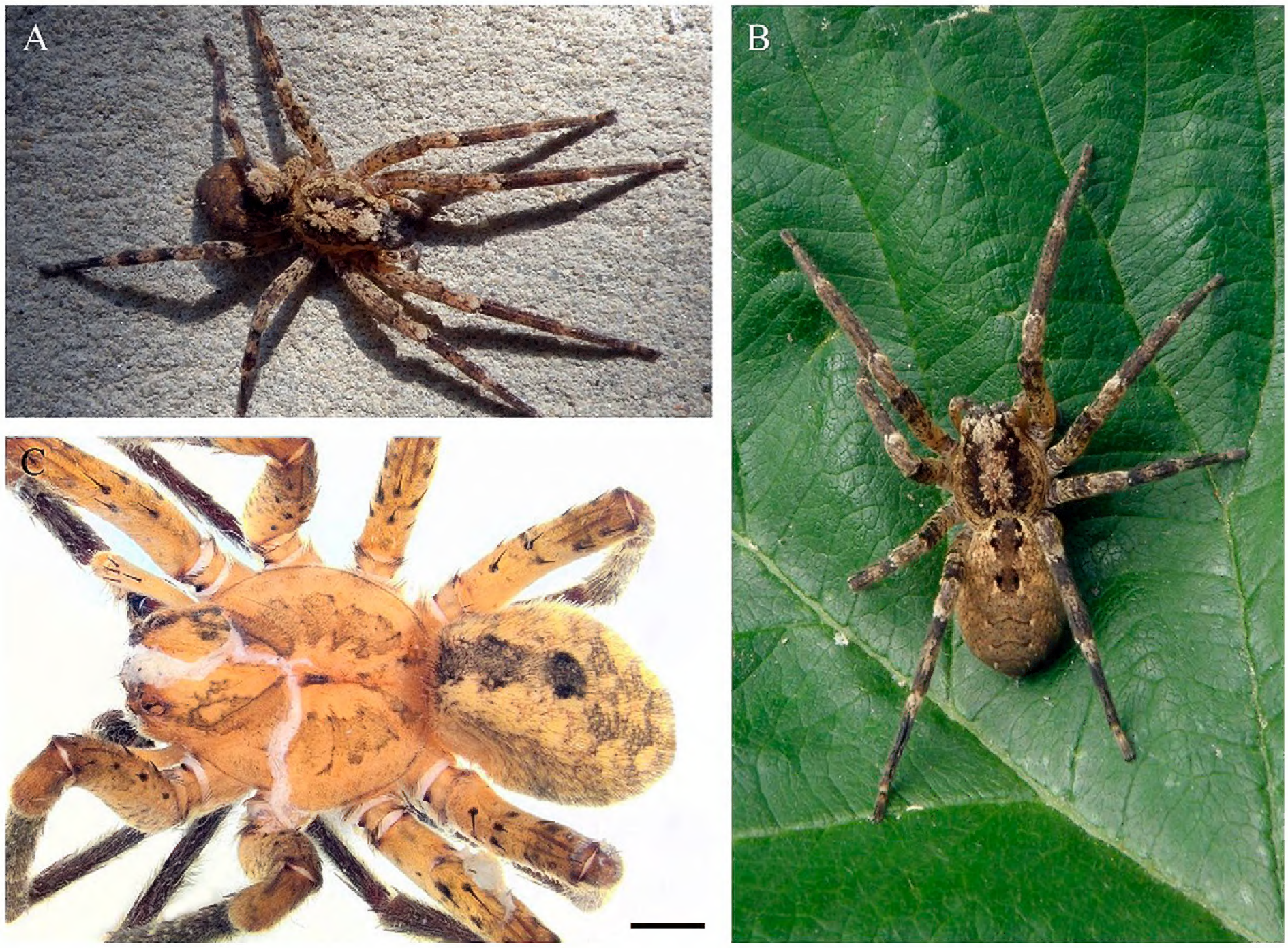

Figure 4. *Zoropsis spinimana* (Dufour, 1820) from Slovakia. **A.** First adult female from Bratislava, Vrakuňa (photo by M. Everlingová). **B.** Second adult female from Bratislava, Vrakuňa (photo by M. Everlingová). **C.** Adult male from Nitra. Scale bar = 2 mm.

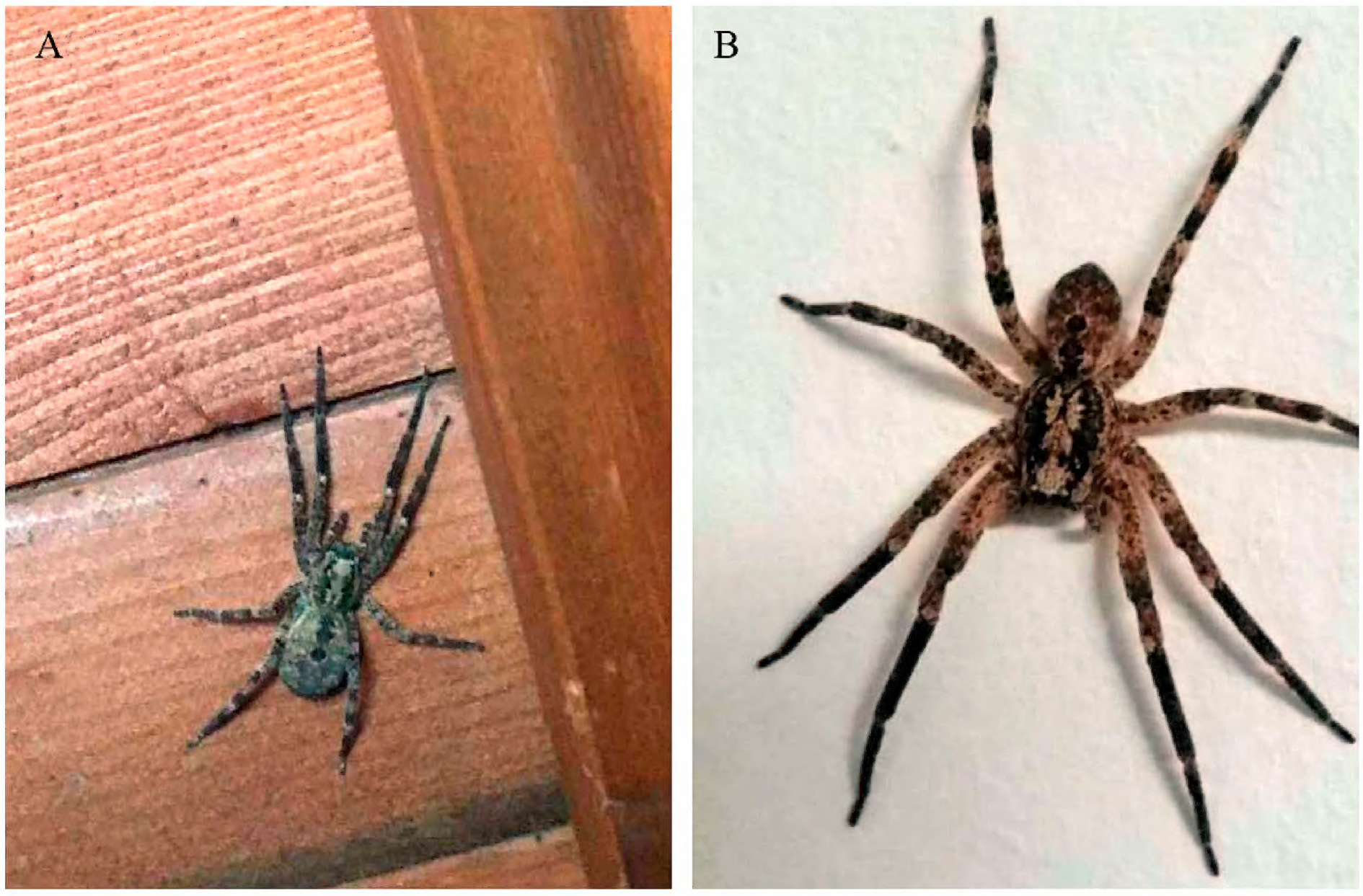

Figure 5. *Zoropsis spinimana* (Dufour, 1820) from Slovakia. **A.** Adult female from Bratislava, Vajnory (photo by S. Kuruc). **B.** Adult female from Pezinok (photo by M. Trojanová).

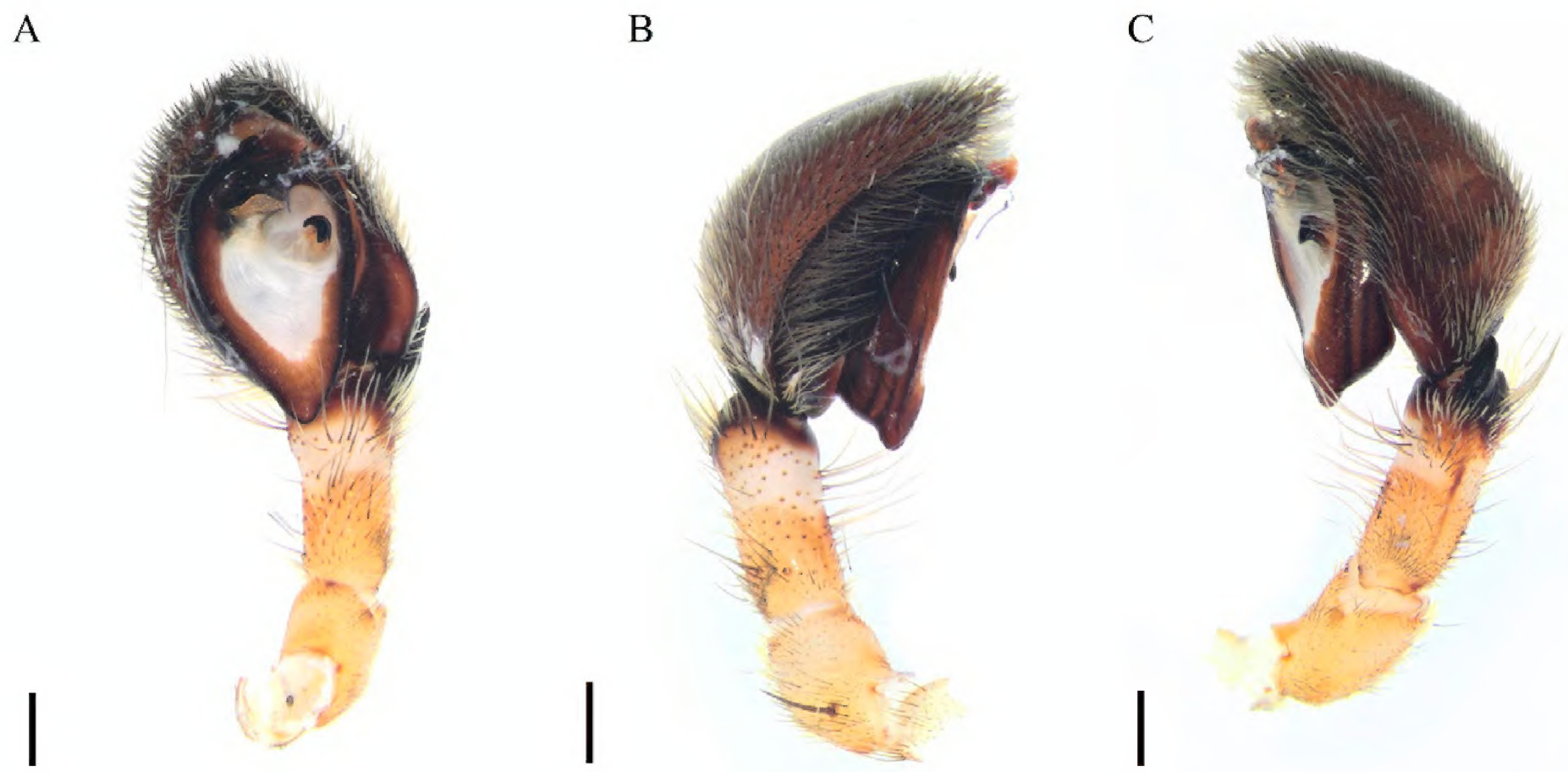

Figure 6. *Zoropsis spinimana* (Dufour, 1820), male from Slovakia. **A.** Left pedipalp, ventral view. **B.** Idem., prolateral view. **C.** Idem., retrolateral view. Scale bars = 0.5 mm.

Figure 7. *Zoropsis spinimana* (Dufour, 1820), female from Slovakia, epigyne. Scale bar = 0.2 mm.

6.65; opisthosoma length: 8.07, width 5.23. **Females:** body length: 13.23 and 16.28; prosoma length: 6.28 and 6.81, width 5.43 and 5.75; opisthosoma length: 6.95 and 9.44, width 4.13 and 6.83.

Discussion

The fast-running funnel-web spider *T. hasperi* has a distribution stretching from France to Turkey and southern European Russia (Nentwig et al. 2020; Fig. 1). In the Mediterranean, *T. hasperi* appears to inhabit habitats in direct sunlight, with tube-like silk retreats hidden under stones and wood or in crevices. In Bulgaria it was recorded under stones in open ground (Deltshev 1993); in Sicily, it has been collected from cracks in the rocks (Dentici 2019); in Hungary, it has been found under stones or wood, among tree roots in xerothermic forests, and inside the hollows of tree trunks (Kovács and Szinetár 2012); and in Turkey specimens were collected from the vicinity of a cave (Brignoli 1978) and under a stone (Seyyar et al. 2009). Furthermore, Kovács and Szinetár (2012) often found specimens of *T. hasperi* on the exterior walls of buildings (corners of the walls) in Hungary and Montenegro. Szinetár et al. (2020) emphasized the hemisynanthropic (moderately typical) nature of the occurrence of this species. The presence of *T. hasperi* is indeed often associated with human settlements or cultural landscapes. This species has been collected in vineyards in Switzerland (Hänggi et al. 2014), in an urban forest in the European part of Turkey (Demircan and Topçu 2016), on a green roof in Olympic Park, London, UK (Harvey 2015), and interiors of buildings in Hungary (Szinetár and Vajda 1992) and Switzerland (Hänggi and Straub 2016). *Tegenaria hasperi* was found only in one location in Slovakia. Our data suggest that this spider also inhabits other human-influenced habitats, specifically microhabitats in gardens. We assume that there are a sufficient number of microhabitats suitable for its occurrence in gardens, such as cavities under stones or tree roots. It is questionable whether the finding of two males represents a unique case of introduction or natural spread northwards from Hungary. Szinetár and Vajda (1992) assumed that synanthropic occurrence in Hungary is a way for this originally Mediterranean species to spread further north. Brignoli (1978) discussed the presence of *T. hasperi* in Turkey as a result of accidental passive transport with traded commodities from Italy in historical times. Future investigations are needed to determine if *T. hasperi* occurs exclusively in gardens or also inhabits more natural habitats in Slovakia.

In Europe and the Caucasus, Spiny False Wolf Spider, *Z. spinimana*, is distributed from the Mediterranean to the European part of Russia and Georgia (Nentwig et al. 2020; Fig. 3). In 1992, this species was found to

be introduced into the USA (Griswold and Ubick 2001). Since the mid-1990s, *Z. spinimana* spread to the northern parts of Europe, with the first published records coming from Austria (Thaler and Knoflach 1998) and Switzerland (Hänggi 2003). More recently, *Z. spinimana* recorded in Germany (Hänggi and Bolzern 2006), Belgium (Lambeets et al. 2007), the Netherlands (van Helsdingen 2007), Hungary (Szinetár et al. 2014), Luxemburg (Massard and Geimer 2018; Kreuels et al. 2019), and the Czech Republic (Dolejš and Prudek 2019). Outside continental Europe, the species is known to occur in the United Kingdom (Harvey 2012) and the Azores (Borges et al. 2013). *Zoropsis spinimana* originated from the Mediterranean (Thaler and Knoflach 1998), where it lives under bark and stones in open forests, but it also often occurs synanthropically in buildings and on their facades (Nentwig et al. 2020). In Central Europe, its occurrence is mostly eusynanthropic (Szinetár et al. 2020), being found in the interiors of buildings, and sporadically in the vicinity of human dwellings as well (Hänggi and Bolzern 2006; Kreuels 2007a; Lambeets et al. 2007). Hänggi (2020) described finding it in birdhouses, which show that this species can in some cases be found outside of human dwellings. The previous record closest to our findings was from a car service station in Brno (Czech Republic), but *Z. spinimana* is not yet considered established in the Czech fauna (Dolejš and Prudek 2019). The rail and road traffic concentrated along the Rhine, together with the favourable climatic conditions there, may be of importance for the spread of this species in Germany (Nedvěd et al. 2011). In Slovakia as well, *Z. spinimana* was recorded exclusively from synanthropic habitats in four cities of the western region (Bratislava, Nitra, Pezinok, and Sereď). While the finding in the warehouse of the logistics centre in Sereď could be an accidental occurrence, because there is a possibility of transporting spiders with wares, other findings come from the exterior or interior of buildings, suggesting that *Z. spinimana* has been able to create permanent populations in Slovakia. As in neighboring countries, the new records of *Z. spinimana* in Slovakia are all from the Pannonian basin (Fig. 3). It seems likely that the warm climatic conditions of western Slovakia are allowing for this species' spread from Hungary and Austria, where it was earlier recorded (Thaler and Knoflach 1998; Szinetár et al. 2014). Given its occurrence in neighboring countries (Hungary, Austria, Czech Republic), the occurrence of this species in Slovakia is not very surprising. It is very likely that this species will continue to spread across Europe and that findings will increase. *Zoropsis spinimana* is a large and conspicuous spider, often observed by the general public, and can be determined using photographs, as were used by us and in other surveys (Harvey 2012; Atlas of European Arachnids 2021; Spider and Harvestman Recording Scheme website 2021). Although this spider is not a medically important species for humans, several observations have shown that *Z. spinimana* is capable of causing painful bites (Emerit and Bonaric 1995; Kreuels 2007b; Nentwig et al. 2013; Bertlich et al. 2018). It is likely that bites of *Z. spinimana* will be reported from Slovakia in connection with its spread, as its synanthropic potential may cause frequent interactions with humans.

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Authors' Contributions

PP identified *Z. spinimana* individuals, measured and photographed individuals and wrote the manuscript. NO and ZK collected and identified specimens *T. hasperi* and revised the text. NH created maps. PG identified some individuals of *Z. spinimana* and revised the text.

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